No. 658,363. Patented Sept. 25, 1900.

H. A. & R. J. HANCOX.

ROTARY ENGINE.

(Application filed Jan. 16, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig 1.

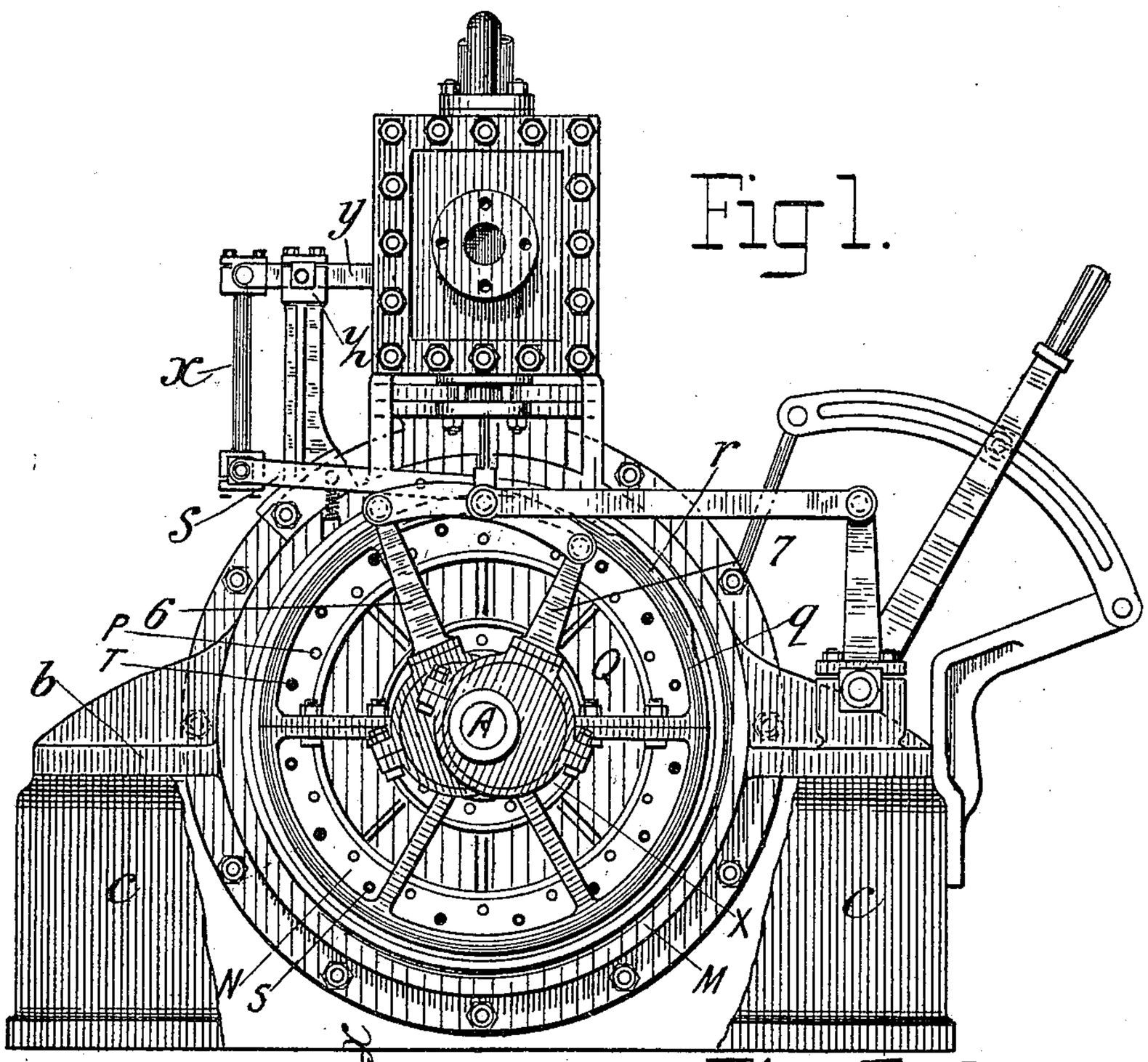


Fig 2.

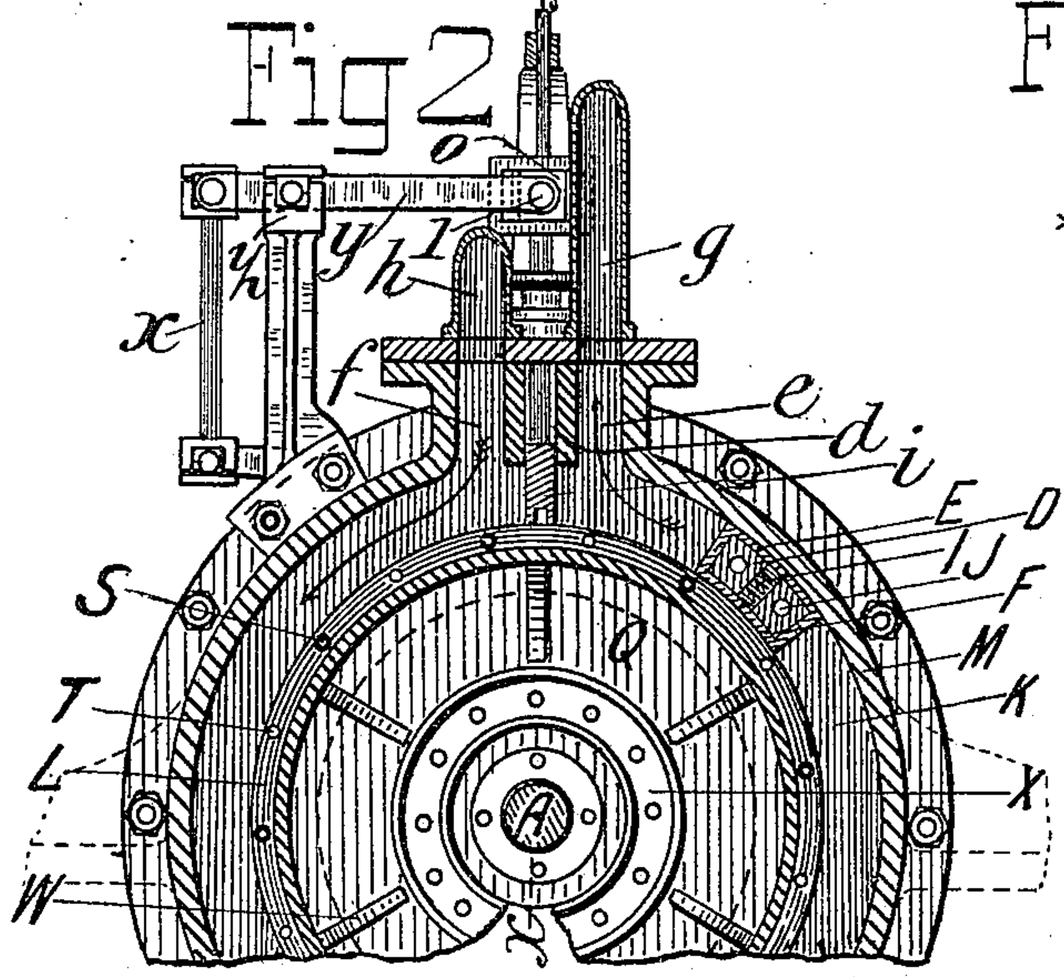
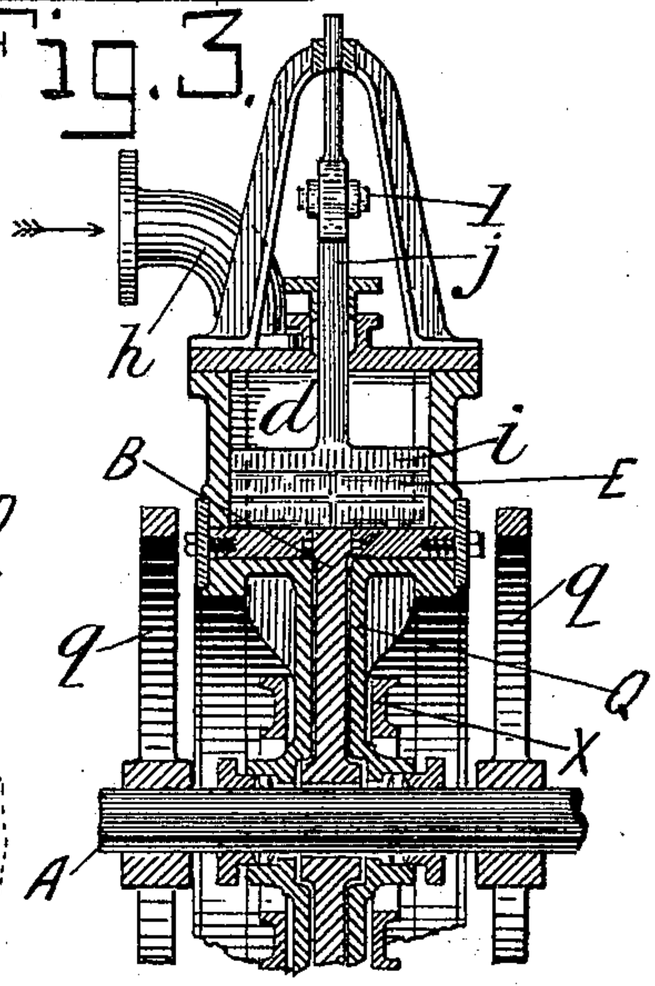


Fig. 3.



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by W. H. Babcock Atty

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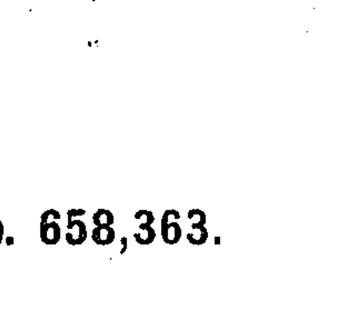
Fig 8.



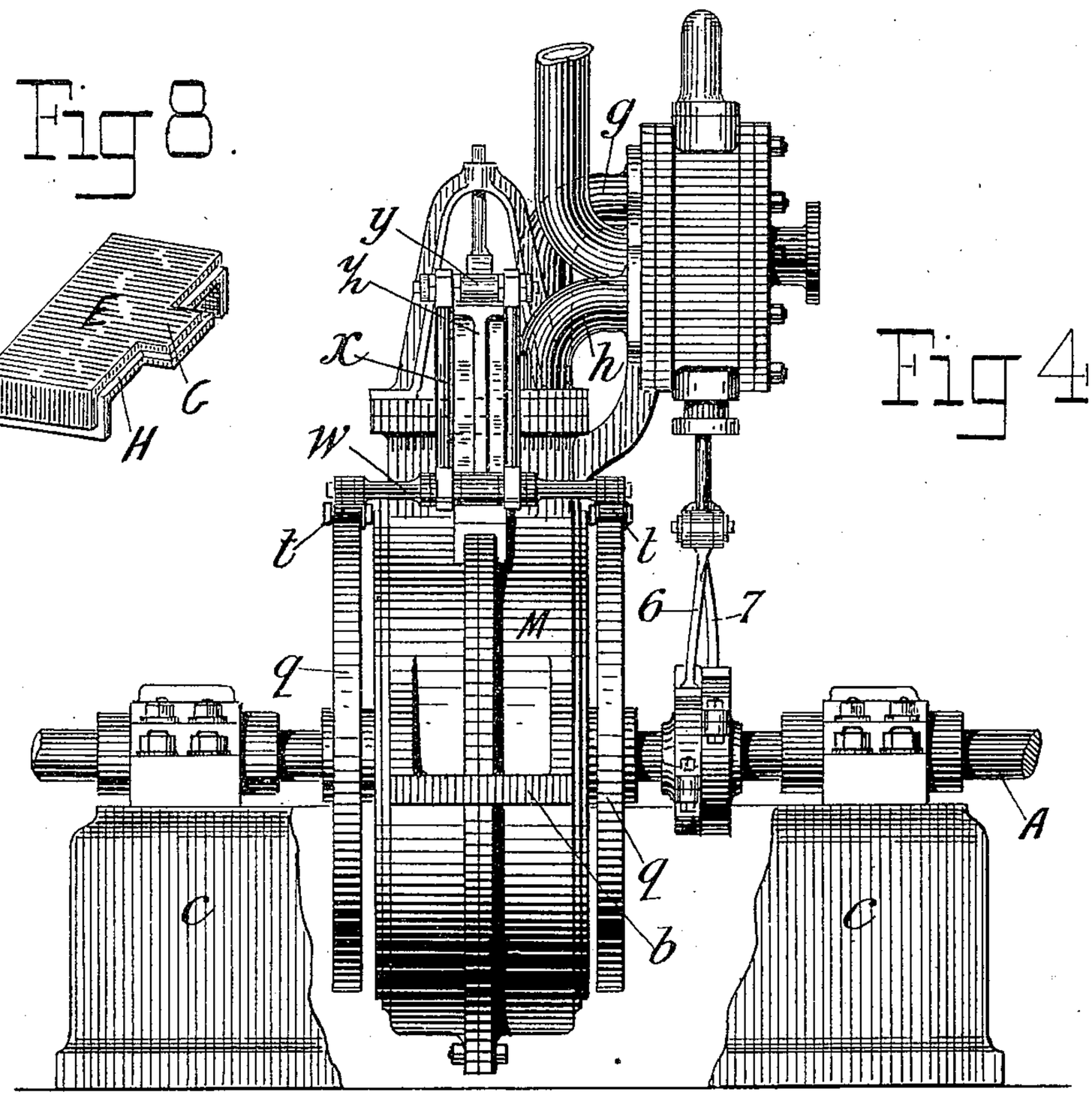


Fig 4.

Fig 5.

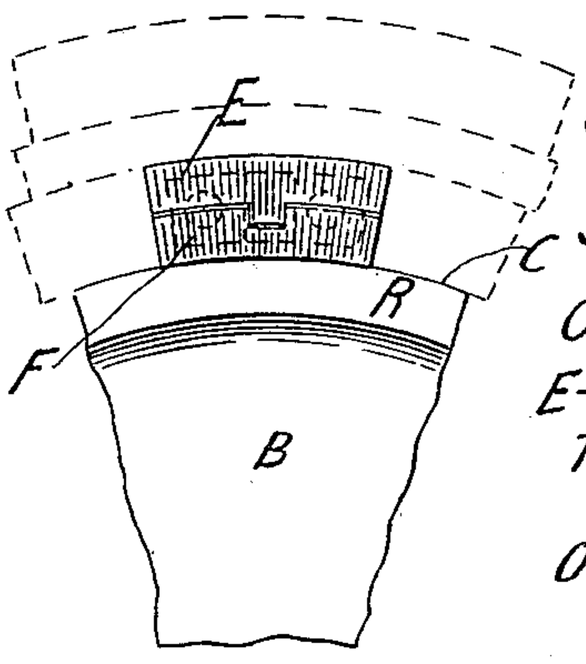


Fig 6.

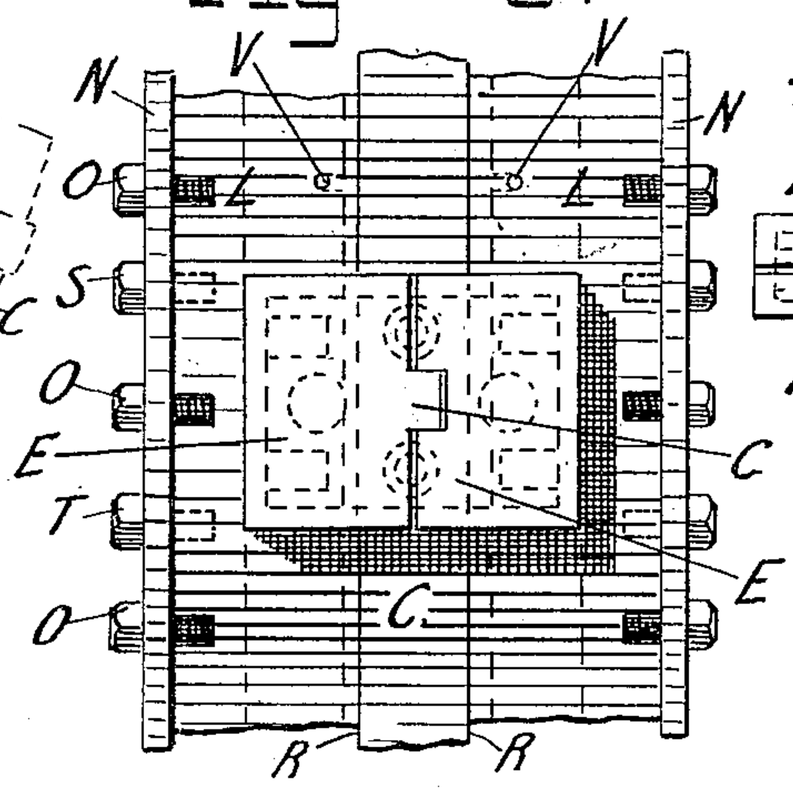


Fig 7.

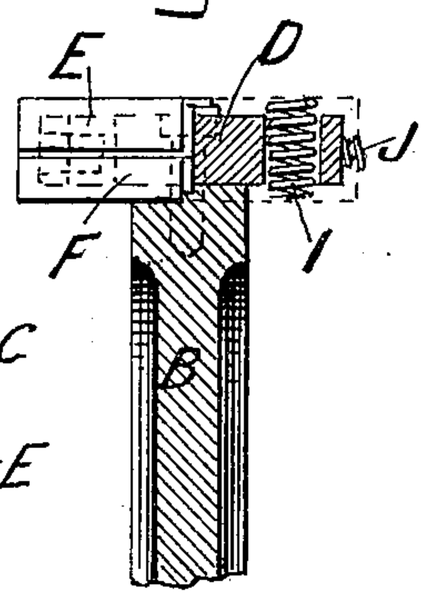


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Fig. 9.

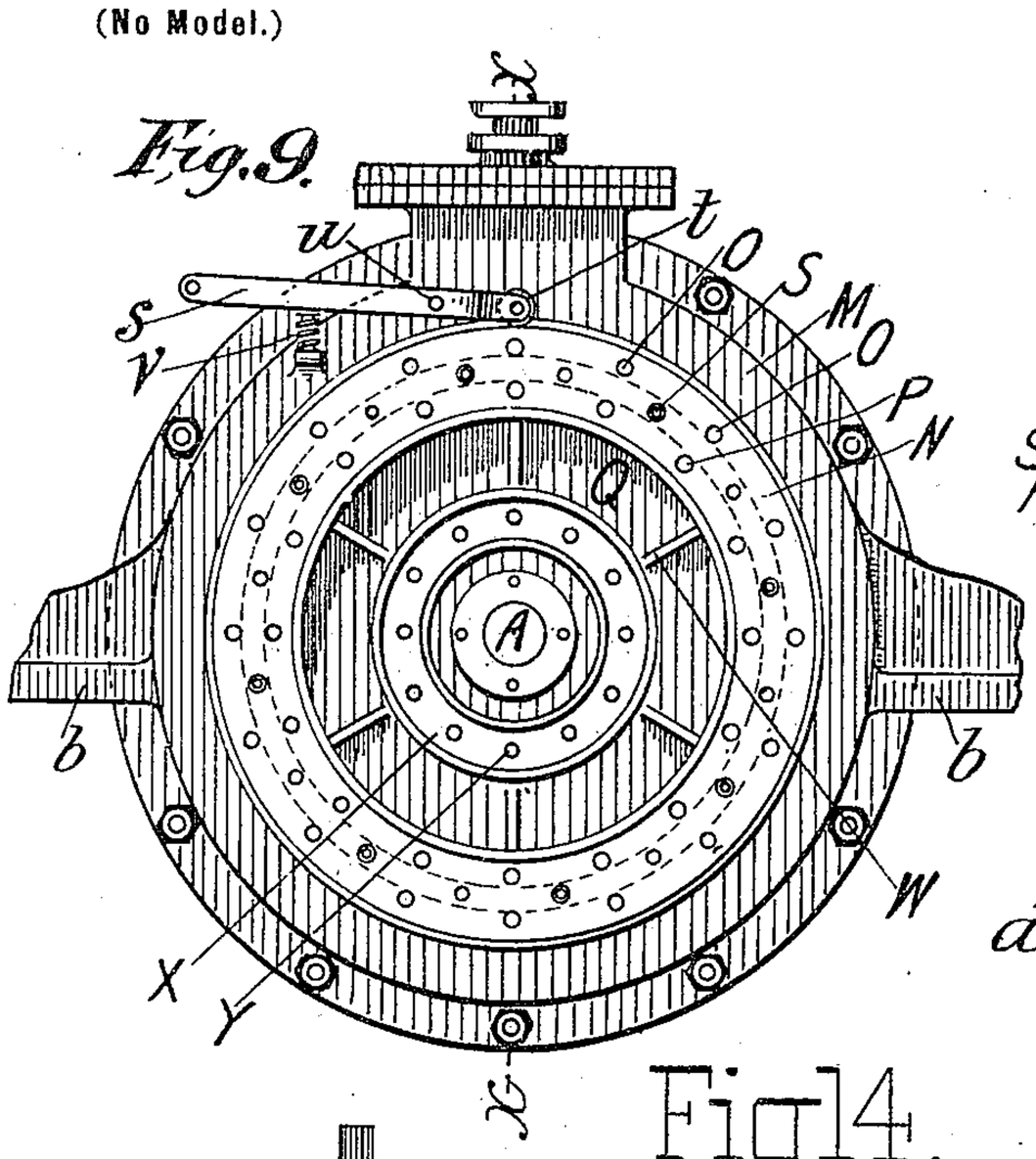


Fig. 10.

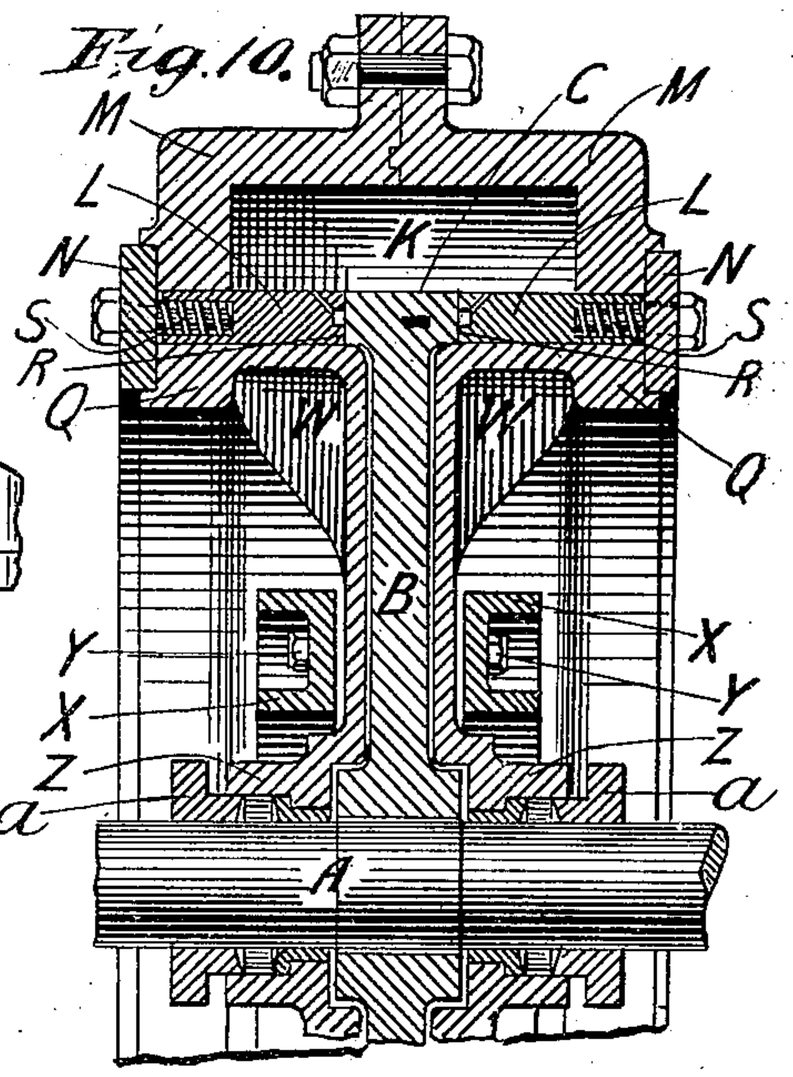


Fig. 14.

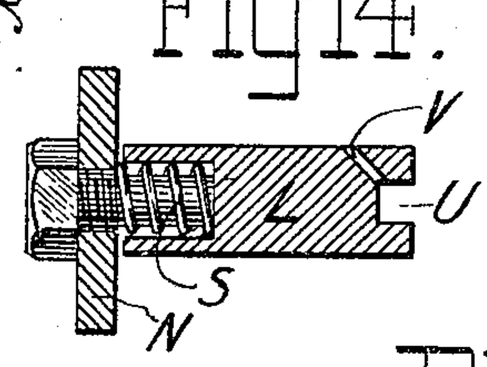


Fig. 11.

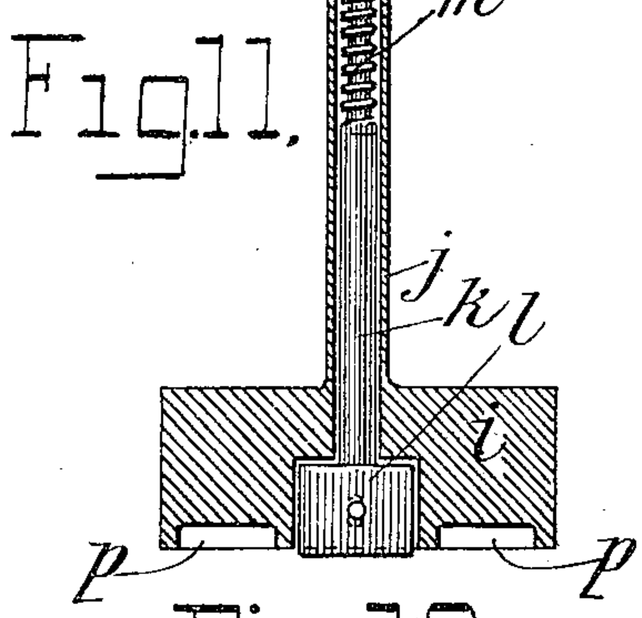


Fig. 12.

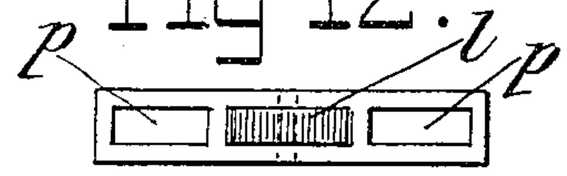
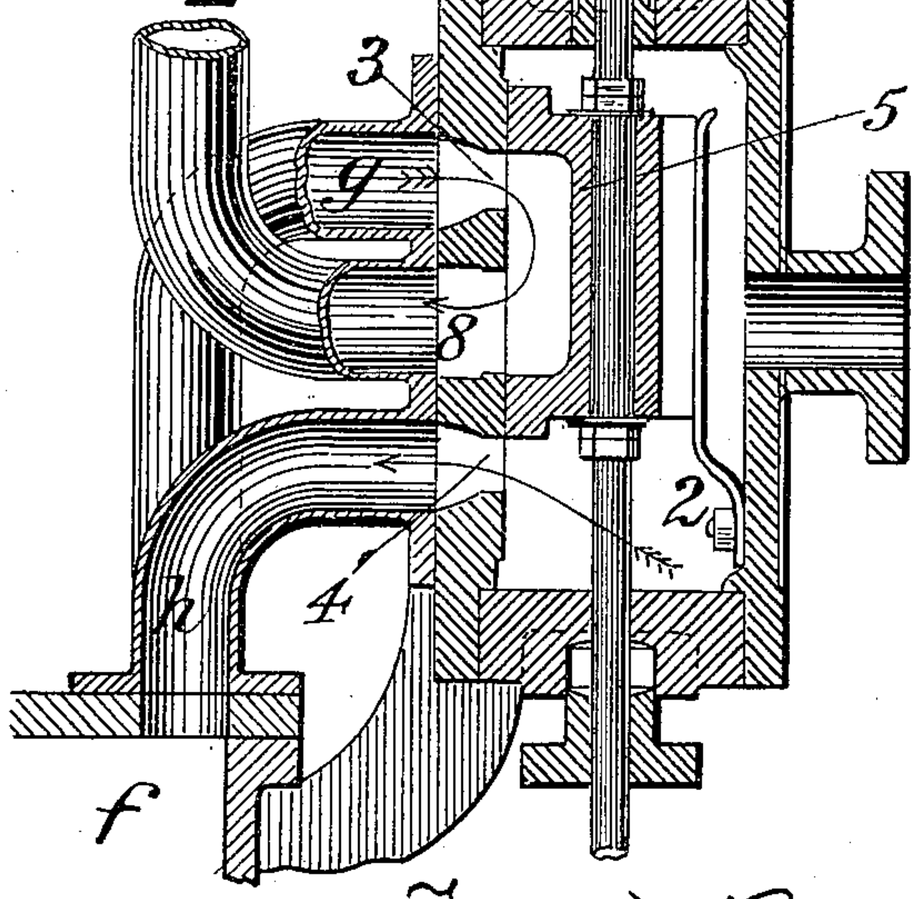


Fig. 13.



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UNITED STATES PATENT OFFICE.

HENRY ALEXANDER HANCOX AND ROBERT JAMES HANCOX, OF SYDNEY, NEW SOUTH WALES.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 658,363, dated September 25, 1900.

Application filed January 16, 1900. Serial No. 1,708. (No model.)

To all whom it may concern:

Be it known that we, HENRY ALEXANDER HANCOX, draftsman, and ROBERT JAMES HANCOX, engineer, subjects of the Queen of Great Britain and Ireland, and residents of No. 151 Mansfield street, Balmain, Sydney, in the Colony of New South Wales, have invented a certain new and useful Improved Rotary Engine, of which the following is a specification.

This invention relates to improvements in that class of rotary engines having a revolving piston rotating in an annular chamber and a sliding abutment which moves to allow the piston to pass, and comprises the peculiar construction and arrangement of the essential parts—that is to say, a disk having one or more piston-blocks fitted with detachable coverings, which are made to expand when in operation, side covers for inclosing the said disk secured by stiffening-rings, which surround stuffing-boxes carrying the main spindle, jointing-rings with circular clamping-plates and spring attachments for keeping the piston-disk steam-tight, a detachable outer casing, which, with the jointing-rings and the piston-disk when secured with the the clamping-plates, forms an annular chamber in which the piston rotates, a peculiarly-constructed radial slide operated by a system of levers actuated by cams, and a valve-chamber and valve constructed to operate the engine in reverse directions.

Referring now to the accompanying drawings, which form part of this specification, and in which similar characters are used throughout the different views to indicate similar parts, Figure 1 is an end elevation of a rotary engine constructed with these improvements, with part of the sole-plate removed to show the essential parts. Fig. 2 is a transverse section in part to show rotary piston and slide-chamber. Fig. 3 is a cross-section in part on line *x x* of Figs. 2 and 9. Fig. 4 is a side elevation showing mechanism for operating radial slide. Fig. 5 is a side elevation showing in detail part of piston-disks and detachable piston-plates. Fig. 6 is a further detail in plan of piston-block. Fig. 7 is a further detail of piston, part in section. Fig. 8 is a perspective view of a removable piston-plate. Fig. 9 is an end elevation of the outer casing of the engine, showing method of securing circular clamping-plates and stiffening-rings, also lower lever for operating radial slide. Fig. 10 is a sectional detail showing various parts associated with the piston and casing. Fig. 11 is a detail in section of a radial slide. Fig. 12 is an edge view of slide-plate. Fig. 13 is a sectional view in detail of slide-valve and associated parts arranged for obtaining reverse movements of the engine. Fig. 14 is a sectional detail showing jointing-rings and circular clamping-plates.

To the spindle A is secured the piston-disk B, whose turned face C carries one or more piston-blocks D, (*vide* Fig. 7,) suitably secured thereto and provided with the detachable and adjustable top and bottom covering-plates E and F, constructed with suitable tongues G and overlapping margins H, which interlock with each other and provide a steam-tight piston. Springs I, concealed within the blocks D, serve to expand the said piston-plates in the desired direction, and the side springs J, which are pocketed in the block D, produce transverse expansion of the piston-plates while rotating in the annular chamber K, which is formed by the disk-face C, the the jointing-rings L, and the detachable outer casing M, which is shown divided centrally and is recessed on the side to receive the circular clamping-plates N, which are secured by the bolts O to the casing M and by the bolts P to the side covers Q. In any convenient part of the casing M removable covers may be provided, which will form part of the casing and serve to give access to the piston or pistons when it is necessary to adjust or renew them. The aforesaid jointing-rings L are kept in position against the side faces R of the piston-disk by means of the springs S, which encircle stud-bolts and are on that account self-adjustable. The bolts T are employed to prevent circular movement in the jointing-rings L, but do not restrain the lateral movement. (*Vide* Fig. 9.) A recess U is provided in each of the jointing-rings L, having a steam-passage V communicating with the annular chamber K for the purpose of filling the said channels with steam and a lubricant to minimize the friction of the working faces. (*Vide* Fig. 14.) The side covers Q are provided with the stiffening-webs W to prevent undue expansion, and further ri-

gidity is obtained by the use of the stiffening-rings X, secured by the bolts Y, and also provided with set-screws for regulating them as may be necessary. The stuffing-boxes Z are associated with the side covers Q and are provided with the usual glands *a*. The casing M is provided with the foot-plates *b*, secured to the sole-plate *c*.

To provide for the admission of the steam into the annular chamber K, any desired number of steam-admission chambers are suitably located in the casing M, the number of such being regulated by the number of piston-blocks used. These chambers are divided into the central slide-passage *d* and the steam-passages *e* and *f*, the latter being in communication with the pipes *g* and *h*. The radial slide *i*, which is used to temporarily close the annular chamber K, is constructed with a hollow stem *j*, which receives the spindle *k* of the slide-block *l*, the said block being intended to accommodate itself to the turned face C of the piston-disk B. The spring *m* is used to operate the slide-block *l* and is retained in position by means of the cap *n*, covered by the lever-block *o*. The steam-cavities *p* are provided to serve as cushions during the downward movement of the slide *i*. The cams *q*, secured to the spindle A and made, preferably, in halves, are used to operate the radial slide *i*. The raised surface *r* is suitably located in its relationship to the piston to insure the raising of the slide *i* in advance of the piston as it rotates. The bottom levers *s*, carrying friction-rollers *t*, are suitably pivoted upon the pin *u*, the side springs *v* serving to keep the aforesaid rollers in contact with the cams *q*. These levers *s* are united by the cross-spindle *w*, the links *x* connecting the cross-spindle to the top lever *y*, supported in the bearing *z*, which in turn is connected to the lever-block *o* by the pin 1.

To operate the piston in reverse directions, the steam-chamber 2 is provided in close proximity to the steam-admission chambers associated with the annular chamber K. The inlet-ports 3 and 4 communicate with the steam-passages *e* and *f* by means of the pipes *g* and *h*. The slide-valve 5 is actuated in the ordinary way by eccentrics and link-motion; but to provide for the peculiar action of the valve, the long and short eccentric-rods 6 and 7 are essential. (*Vide* Fig. 1.) The position of the valve in Fig. 13 indicates that the longer eccentric-rod is in use. Steam is shown passing through port 4 and thence by pipe *h* into steam-passage *f*, which would move the piston in the direction shown by the arrow in Fig. 2, and when a revolution has been made the steam used for actuating it would pass out of the passage *e* by means of pipe *g*, through port 3, and out of exhaust-port 8, as indicated by the arrow in Fig. 13. By the peculiar action of the slide-valve 5 provision is made for a complete circuit of the steam and for preventing its return into the same passage whence it enters to operate the piston, so that in Fig. 13 is demonstrated the fact that both admission-ports 4 and 3 are in use simultaneously and that the slide-valve is only required to travel one-half the distance of the ordinary slide-valve. If the position of the valve be changed so as to open port 3 in the same manner as port 4 is shown, reverse action of the piston would be obtained, and the pipe *h* would then be in communication with exhaust-port 8, the short eccentric-rod 7 having to be brought into play to accomplish this result.

If this class of engine be used as a condensing-engine, it would be associated with the usual pumps, and the peculiar construction of the piston herein employed, together with the associated parts, would be serviceable for such a purpose. The steam-chamber 2, with its associated parts, would be unnecessary; but the pipes *g* and *h* in an amended form would be retained to allow for the inlet and discharge of the water or air, according to the purpose for which it was used. The pump, being a necessary adjunct, would be attached to the spindle A and would be actuated by the rotary engine.

Having now described our invention, we desire to state that we are aware that a rotary piston running in an annular casing is not novel; but when used in association with the improvements described herein greater efficiency is obtained than heretofore.

Therefore what we claim as new, and desire to secure by Letters Patent, is—

1. In rotary engines of the class set forth, the combination, with a rotary disk carrying one or more piston-blocks, of, side-covers jointing-rings L, bolts passing through the said rings and adapted to hold them against rotation, while allowing their lateral motion, and springs surrounding the said bolts for pressing the said rings against the piston-disk, substantially as set forth.

2. In rotary engines of the class set forth, the combination, with an annular chamber of the kind described, of, a radial slide with steam-cavities formed therein, and, a central slide-block made adjustable and operated in the manner described, as described, and shown and for the purposes set forth.

3. In rotary engines of the class set forth, the combination, with an annular chamber constructed in the manner described, of, a radial slide provided with an independently-movable slide-block, means for reciprocating the said slide at suitable intervals and side springs operating against the said block transversely to the line of movement of the said slide, substantially as set forth.

In witness whereof we have hereunto set our hands in presence of two witnesses.

HENRY ALEXANDER HANCOX.
ROBERT JAMES HANCOX.

Witnesses:
JOHN J. STONE,
LESLIE L. PHILLIPS.